
Chapter 13 The Loch Torridon District — Rona and Raasay

The portion of this chapter dealing with Loch Torridon is by Mr. Hinxman; the part descriptive of Rona and Raasay by Mr. Teall. The whole of the district is comprised in Sheets 81 and 82 of the Geological Map of Scotland on the scale of (1:63360) one inch to a mile.

A. Loch Torridon

This district is bounded on the north by the southern limit of the ground described in Chapter 12, and extends southward across Loch Torridon as far as the Lewisian rocks appear at the surface or to a line drawn from the head of Loch Gaineamhach eastwards by the head of Loch Shieldaig to the foot of Loch Damh, as shown on the map. The Lewisian rocks form around the constricted part of Loch Torridon and on the southern shore of the upper loch a series of irregularly-shaped inliers surrounded and separated by the Torridon Sandstone.

A few small inliers also appear among the Torridon Sandstones in the valley that separates Liathach from Beinn Dearg, and on the western slopes of the latter mountain. Part of the pre-Torridonian topography is well displayed here. The two areas of gneiss to the east and west of Loch Shieldaig may be regarded as portions of two parallel ridges of that ancient land-surface from which the overlying sedimentary strata have been to a greater or less degree removed by denudation<ref>See A. Geikie, *Nature*, XXII. (1880), p. 400.</ref>. The westernmost of these ridges forms a continuous belt of varying breadth that extends in a north-east direction from Croicbheinn in the Applecross peninsula into the Shieldaig Forest on the north side of Loch Torridon — a distance of about 12 miles. Its summits on the south side of the loch reach a height of from 500 to 900 feet above sea-level. Across the Narrows the gneiss rises to 1000 feet above Loch Diabaig, and reaches the 1750 feet contour-line on the slopes of An Ruadh-Mheallan, the crest of the ridge at this point being still concealed beneath the sandstones.

The eastern ridge is represented by a series of disconnected areas that begin in the north with the inliers on Beinn Dearg. On the further side of the pre-Torridonian depression that is partly occupied by Upper Loch Torridon, the gneiss appears again on the promontory between Ob Gorm Mòr and Ob Gorm Beag, and forms a large area round the foot of Loch Damh and the Balgy River. The two ridges seem to be connected beneath the northern end of Beinn Shieldaig by the gneiss of the Shieldaig peninsula. The sandstones of Ben Shieldaig can be seen. to lie in an old valley of the gneiss which rises from sea-level on either side of that hill.

The surface of the gneiss of the western ridge, especially in the Diabaig area, is extremely bare and rugged, the country having been carved into a succession of abrupt rocky hills, separated by deep ravines, and cup-shaped hollows containing small lochans. Much of the present character of the ground is no doubt due to denudation subsequent to the removal of the Torridonian strata, and many of the deeper ravines have been excavated along the lines of post-Torridonian faults. The surface of the eastern ridge is likewise peculiarly rocky and bare of superficial deposits. Only on the ground to the north-west of An Ruadh-Mheallan, in the hollows east of Meall Dearg, and about the foot of Loch Damh, is there any considerable extent of glacial drift or peaty covering.

Early basic masses of the Fundamental Complex

Only one instance of an ultra-basic mass forming part of the original complex has been observed in the area between the Craig River and Loch Torridon. It lies between Loch na h'Uamhaig and An Ruadh-Mheallan, a mile and a half N.N.E. of Upper Diabaig. It forms a lenticular band one-third of a mile in length, the western end passing beneath the red grits of the basal Torridonian group. It measures 50 yards across its widest portion. The rock is an olivine-hornblende-peridotite. Other examples of the same type occur to the north of the Craig River.

The numerous narrow bands of foliated amphibolite and hornblende-schist, that appear at first sight to form an integral part of the gneiss in the areas where it has been affected by the secondary foliation, can for the most part be shown to have an intrusive origin. They are more fully described in the section dealing with the dykes of the district. Other foliated

basic masses of more doubtful origin, however, may possibly represent basic portions of the original complex. Where the original banding has not been destroyed, the usual knots and lenticular bands of hornblende-rock appear here in more or less abundance, and it seems probable that some of the more basic bands in the reconstructed flaggy gneiss may represent these early masses in an altered condition.

Gneiss of the Fundamental Complex

The original type of the gneiss is best displayed in the extreme northern part of the area between the Craig River and An Ruadh-Mheallan. It is there a massive quartzose pyroxene or hornblende-rock in which the early banding is often very indistinct. South of Loch Airidh Eachainn narrow bands of micaceous gneiss with a north-west strike and secondary foliation begin to appear, the discordance between the older and newer foliation-planes being distinctly apparent. Towards the shore of Loch Torridon the older banding becomes almost entirely replaced by the secondary foliation, though even where the latter is most prevalent the wavy lines of the older planes can generally be detected on close examination.

This modified gneiss is typically developed along both sides of Loch Shieldaig, and on the promontory which separates that loch from Upper Loch Torridon. It belongs to Group IV. 1 of the classification detailed in Chapter 4, and consists of rocks in which biotite is the principal ferromagnesian constituent, with quartz and felspar. It presents the appearance of a flaggy, thoroughly-foliated, micaceous gneiss, often highly felspathic, and sometimes containing hornblende in addition to the biotite.

A large proportion of it is highly acid, consisting chiefly of quartz and felspar, and having the appearance of a foliated pegmatite. These pegmatitic bands, that are now thoroughly incorporated and plicated with the gneiss, may represent an early acid intrusion forming part of the rocks of the original complex.

Inlier of Beinn Dearg

The muscovite-biotite gneiss of Group V. (ante, p. 44) is typically developed in the inlier of Lewisian rocks that lies at the head of Coire Mhic Nobuil between Beinn Dearg and Liathach, about a mile and a half to the north-east of Torridon House. This inlier occupies a triangular space about half a square mile in extent on the southern slopes of Beinn Dearg, rising at its apex to a height of upwards of 1800 feet above sea-level. The unconformable junction between the gneiss and the overlying Torridon Sandstone is well seen on the west side above the 1500 feet contour-line; and a good section of the gneiss is exposed along the bed of the stream in the bottom of the valley. The intervening slope is obscured by drift and the hill-wash brought down by the mountain torrents.

The rocks of this area have been thoroughly reconstructed. They show marked parallel foliation, and in certain places are even schistose in character, their divisional planes often having a silvery lustre from the white mica developed on them. In addition to the micas, they contain microcline, oligoclase, and quartz, and show traces of cataclastic structure.

Associated with these muscovite-biotite-schists there are bands in which biotite is the predominant mineral; while others, chiefly composed of quartz and felspar, possibly represent sheared pegmatites. Bands and even of garnetiferous amphibolite may also be observed, some of which are markedly schistose. The origin of these basic bands is doubtful; possibly some of them may be portions of the early complex.

The strike of the gneiss in this area is generally N.N.W. the foliation-planes being vertical or dipping west at high angles. The early banding in the original type of gneiss of the northern area has a general north-east strike, but with local variations, the rocks sometimes undulating and dipping in various directions at low angles. The foliation-planes are almost invariably crumpled and irregular in their arrangement. The reconstructed flaggy micaceous gneisses are distinguished, on the other hand, by the uniform disposition of their divisional planes. The foliation dips steadily to the north-east at angles of 40°–50°, giving a striking appearance of regularity to the rocks along the coast east of Diabaig. This regularity is heightened by the banding effect produced by the numerous narrow belts of dark basic material that are foliated with the gneiss.

Dykes

Reference has already been made to the occurrence of numerous parallel bands of basic rock that traverse the gneiss in a south-east-north-west direction, more or less parallel to the strike of the secondary foliation of the gneiss. The thinner bands, varying from a few feet to 20 yards in breadth, are, as a rule, completely foliated throughout, and the intrusive relations of these belts of hornblende-schist to the surrounding gneiss have often been so entirely obliterated by the movement which produced the foliation, that they now appear to form an integral portion of the reconstructed gneiss. This is particularly observable in the ground to the south and east of Lagan Dubh; immediately north of Shieldaig village; on Beinn Tire, west of Loch Shieldaig; and between Kenmore and Arrin a' Chruinach, on the western margin of the most westerly tract of gneiss. Where, however, the original banding has not been destroyed, the transgression of the early lines of structure by the foliated basic bands is distinct, and their dyke-like relations to the original gneiss can be clearly established. The evidence of this discordance between the two sets of structure-lines is well seen in the area round Loch Airidh Eachainn, three-quarters of a mile N.N.E. of Loch Diabaigs Airde, on the north side of Loch Torridon.

In addition to these hornblende-schists, many other bands and masses of basic rock may be noted, whose intrusive origin in the form of dykes is plainly apparent. They consist of foliated or unfoliated amphibolites (epidiorites), distinctly coarser and less foliated in the centre than at the edges, and often so felspathic as to present a mottled appearance in the central portions, or even with distinct phenocrysts, now replaced by aggregations of secondary feldspar. One of these coarse felspathic epidiorite dykes crosses the point of Rudha na-h-Airde Glaise, opposite Loch Shieldaig, where it has a breadth of more than a hundred yards. A continuation of the same dyke appears on the promontory a mile to the north-west, where the central position is unfoliated, and has a peculiarropy or convoluted appearance, from which it derives its local name of the "Guts rock". A short distance inland this dyke suddenly contracts to a width of a few yards, changes its direction, and, cutting across the foliation-planes of the gneiss, coalesces with a parallel dyke a short distance to the east.

A group of coarse epidiorite dykes, foliated only at the margins or along certain bands, traverse the gneiss in the area between An Ruadh-Mheallan and Upper Diabaig. The boundaries are in many places irregular, with branches and apophyses penetrating the gneiss and crossing the lines of banding. One of the largest of the basic dykes in the whole district crosses the Craig River three-quarters of a mile west of Loch Gannach Beag (on the northern margin of Sheet 81), and to the south of that stream has a breadth of over 90 yards. The dyke can be followed along the slopes of An Ruadh-Mheallan, where for nearly $\frac{1}{4}$ mile it is partially covered by the sandstones. It is then thrown 120 yards to the east by the Loch Diabaigs Airde fault, and finally disappears beneath the Torridonian rocks in the bed of the Alligin burn. The rock is a coarse epidiorite, and nowhere along its course shows any distinct parallel structure.

The numerous dykes that cross the Shieldaig promontory are more completely foliated than those just described, the narrower bands having been converted into hornblende-schist. Another basic mass of somewhat irregular outline runs north-westwards from the shore of Ob Mheallaich. It is 500 yards in length, with a maximum breadth of 130 yards, but thins out rapidly towards its western extremity. The rock is mostly coarse and felspathic, but foliated throughout. Its intrusive origin is shown by its relations to the surrounding gneiss where the latter is in an unmoved condition.

Between Shieldaig and Camas an Leim several other dykes may be seen, 30–40 yards in breadth, consisting of foliated epidiorite, often coarse and with conspicuous feldspar in their central portions. At Camas an Leim they are much dislocated by a set of parallel faults that run N.N.E.

The connection of the foliation of the basic dykes with the movements that produced the secondary north-west foliation is well shown in the area between Ob Mheallaidh and Balgy. A broad dyke of coarse epidiorite runs north-west from Balgy and traverses an area of mostly unmodified gneiss in which the early north-east banding is still prominent. Save at the extreme edges in a few places, this dyke is entirely unfoliated, while a branch of the same dyke, which crosses an area of flaggy micaceous gneiss a short distance to the south, has been completely sheared.

On the Aird Mhor, the point of land which separates Ob Gorm Mor from Ob Gorm Beag, a broad basic dyke has weathered out, forming a trench-like hollow, an unusual feature in the dykes of this district. The vertical wall on the north side of this hollow shows distinct glacial striae, so that the weathering-out of the dyke was anterior to the last glaciation of

the country.

Later pegmatites

In addition to the acid rocks resembling sheared pegmatites that are incorporated with the gneiss, many veins of pegmatite appear to which a later origin can be assigned. Some of them follow a direction parallel to the planes of foliation of the flaggy granulitic gneiss, but others distinctly transgress the foliation of the different members of the gneiss and of the hornblende-schist bands. Many of them are well-foliated, and in some cases show marked "augen-structure" with large "eyes" of microcline. Their foliation is parallel to that of the rocks in which they occur. It would therefore seem probable that this last intrusion or segregation of acid material began before the movements that produced the secondary foliation had entirely ceased, and that the pegmatites have shared in some cases in these movements.

These foliated pegmatites are well seen on the Shildaig promontory, especially to the north and north-west of the village, where they traverse the bands of foliated basic rock. The later pegmatites are also abundant along the coast-section on the north side of Loch Shildaig and on the Ardheslaig peninsula. On the north and west sides of the latter locality several veins of unfoliated acid rock of considerable breadth have been intruded along the foliation-planes of the gneiss.

Normal faults

Reference may here be made to the numerous more or less parallel normal faults which, with a prevalent north-easterly trend, traverse the Lewisian areas as well as the Torridon Sandstone of this district. The most powerful of these dislocations, which has determined the line of the valley of the Aliplecross River, crosses Loch Shildaig from Inbhirban to a point immediately east of Rudha na h-Airde Glaise. That portion of its course which falls within the district now under description is of post-Torridonian age. The fault throws down the Torridon Sandstones to the east against the Lewisian rocks along the lower part of the Allt an t-Strathain, and again on the north side of Loch Torridon for a distance of nearly a mile along the burn that flows past Alligin Suas.

Another fault which crosses the district from a point on the coast half a mile south-east of Loch Diabaig to Ruadh-Mheallan is also of post-Torridonian age, and lets down small patches of the basal grit and breccia among the gneiss to the north of Loch Diabaigs Airde. This fault appears to join the Applecross–Inbhirban fault along the eastern slopes of An Ruadh-Mheallan, and the line of dislocation can be further traced through the Shildaig Forest to Bus-Bheinn, a short distance south of Loch Maree.

The Lewisian area on the south side of outer Loch Torridon has its western margin defined by a fault which runs southwards from Arrin-a-Chruinach past Loch na Creige, and brings down the Torridon Sandstone against the gneiss which along the fault face forms a vertical cliff above the eastern shores of that loch.

B. Rona and Raasay

The island of Rona is wholly composed of Lewisian gneiss, and presents the usual features of that formation. The elevated portions consist of bare rock alternating with peat and heather. In the low ground about the Dry Harbour and Doire na Guaile small irregular patches are cultivated by the few crofters who inhabit the island, and used for growing potatoes and oats. There is also a little pasture land on which a few cattle are reared, while trees are feebly represented by a small plantation of hazel and rowan on the north side of Big Harbour.

The only rocks capable of representation on the geological map are the fundamental gneissose complex, black bands or dykes of hornblende-schist, and two or three dolerite-dykes of Tertiary age. Pegmatite veins also occur.

The fundamental gneiss is variable in its petrographical character, but the different types are not distributed in such a way as to make it possible to represent their distribution on the geological map. The prevailing rock is a biotite-gneiss with microcline, but hornblende-gneisses are not uncommon. Small lumps of hornblende-rock are occasionally found. Where the relative ages of two masses of rock belonging to the same complex can be determined, the more basic mass is the

earlier. Thus the veins are more acid and the inclusions more basic than the surrounding rocks. Definite parallel banding is by no means a well-marked feature of the gneiss as a whole, and when present is rarely found to be persistent for any considerable distance. A few arrows have been placed on the map marking the local dip of the main foliation, but these are of very little value, for in vertical sections dips in different directions may frequently be observed. There is nothing either in the structure or composition of the gneiss to suggest that any portion of it is of sedimentary origin.

The dark bands of hornblende-schist are the only portions of the Lewisian Gneiss which are capable of separate representation on the geological map. These are fairly uniform in petrographical character, offering in this respect a marked contrast to the fundamental gneiss. In the majority of cases there is no difficulty in separating them from the gneiss, but as the more basic portions of the latter sometimes resemble them, it was found difficult, in the case of one or two isolated exposures, to say to which group a particular rock belonged.

That the basic hornblende-schists or the original rocks out of which they have been formed were later in date than large portions, if not the whole of the mass which is mapped as fundamental gneiss, is proved by the occurrence of transgressive junctions. Such junctions may be observed at the margins of the two bands to the left of the path leading from the landing-stage to the Lighthouse in the extreme north of the island. But notwithstanding the clear evidence of transgressive junctions, there is on the whole a parallelism between the foliation-planes of the gneiss and the margins of the black bands. Where a north-west and south-east strike is strongly marked the foliation in the hornblende-schist is usually parallel with the junctions; in other cases, there is frequently great confusion in the arrangement of the foliation. The thicker the band the coarser is the texture, and the marginal portions often have a finer grain than the more central parts. In the northern part of the island the bands dip at a high angle, and their north-west and south-east strike is strongly marked. South of Big Harbour the dip is much less and the bands are in places horizontal, so that the hornblende-schist forms much larger portions of the surface. In this district the north-west and south-east strike is lost.

The northern part of the Island of Raasay is mainly a repetition of the features seen on Rona. In the neighbourhood of Torran the dreary monotony of the typical Lewisian landscape is relieved by small trees and bushes of birch, hazel, and willow, but this is due in a large measure to a small isolated patch of Torridonian Sandstone which fringes the shore below the Schoolhouse and runs inland in the form of a tongue as far as Upper Amish.

The main divisional planes of the gneiss often dip at gentle angles. There is, however, on the whole, a north-west and south-east strike, and it appears as if the layers were arranged in elliptical domes and troughs, the longer axes of which lie in this direction. Vertical or nearly vertical jointing is also strongly marked, and this gives rise to gashes, escarpments, and sometimes actually overhanging cliffs. The zones of vertical jointing often run in a north-west and south-east direction, and the separate joints are not infrequently occupied by Tertiary dykes of olivine-dolerite. The gneiss is in the main of an acid type. biotite-gneiss is the dominant rock, but hornblende-gneiss and lumps of hornblende-rock are occasionally found.

One very common type is a medium-grained pink gneiss, which forms massive layers, and is often well exposed in cliff faces and inland escarpments. Some portions of it are rich in biotite; others are almost entirely composed of quartz and feldspar. The two varieties are arranged in layers or "schlieren", and folding and puckering are extremely common. Parallel structure is, as a rule, most marked on faces running north-west and south-east, puckering and folding on those which run at right angles to this direction. The gneisses of more basic character also show a differentiation into white or nearly white quartzo-felspathic portions, and dark, sometimes black, hornblendic portions. The two varieties show banding and puckering of the same type as that seen in the pink gneisses. Pegmatites of two types occur — pink and white. The pink pegmatites, which are the most common, are associated with the pink gneisses, and merge occasionally into the quartzo-felspathic portions of these gneisses. Microcline is the dominant feldspar, and individuals measuring a foot or more across may occasionally be seen.

The white pegmatites are associated with the more basic portions of the gneiss, and oligoclase is the dominant if not the only feldspar present.

Bands of hornblende-schist are not so common in Raasay as in Rona. They are more uniform in character than the gneiss, but the larger masses show marked signs of differentiation. The relations of these bands to the dominant gneiss

are not clear, though there is evidence to show that they are older than some at least of the pink gneisses; for they are often cut by the pink pegmatites, which, as already stated, sometimes merge into the quartzo-felspathic portions of these gneisses.

About 150 yards west of north of the summit of Beinn na h'Iolairie sill-like masses of pinkish granite clearly cut across the banding of the biotite-gneiss. It is possible, therefore, that much of the pink gneiss which is mapped as a portion of the Fundamental Complex may be of later date than the hornblende-schist and of the same age as the gneissose granites of the Laxford area.